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IS 11474 (1985): General requirements of power-operated windlasses and anchor capstans for inland vessels [TED 18: Inland, Harbour Crafts and Fishing Vessels]

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“Knowledge is such a treasure which cannot be stolen”





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Indian Standard

## GENERAL REQUIREMENTS OF POWER OPERATED WINDLASSES AND ANCHOR CAPSTANS FOR INLAND VESSELS

### 1. Scope

1.1 This standard specifies the requirements and testing of windlasses and anchor capstans for inland vessels.

### 2. Definitions

2.0 For the purpose of this standard the following definitions shall apply.

2.1 *Working Load of the Windlass* — The working load derived from the chain diameter and chain grade, measured at the cable-lifter [ see 4.5(a) ].

2.2 *Drum Load at the Warping End or at the Cable Drum* — The force in the mooring rope entering the warping end or cable drum, developed by the main shaft torque appearing at the drum load in the chain cable.

2.3 *Overload Pull* — The necessary temporary overload capacity of the windlass [ see 4.5(b) ].

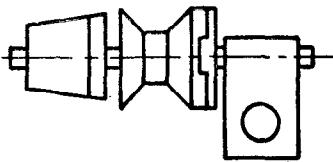
2.4 *Holding Load* — The maximum static load in the chain cable which the cable-lifter brake should withstand [ see 4.5(c) ].

2.5 *Nominal Size of Windlass* — The size expressed in terms of the chain diameter in millimetres, chain grade and holding load.

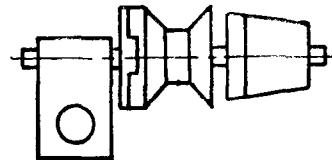
2.6 *Nominal Speed of Anchor Chain* — The average speed of recovery measured at the working load of the windlass ( see 4.3 ).

2.7 *Creep Speed of the Anchor Chain* — The greatest speed of the chain when pulling the anchor into the hawse-pipe ( see 4.4 ).

2.8 *Single Cable-Lifter Windlass—Types 1 and 2* — Anchor machinery with one cable-lifter and an integral power source ( see Fig. 1 and 2 ).

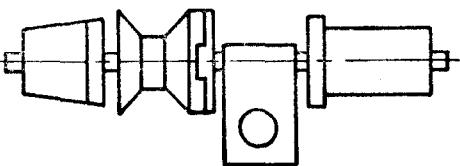


Right-handed

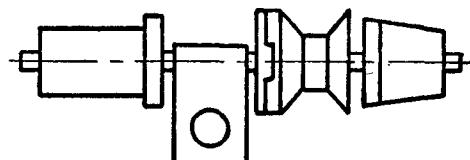


Left-handed

FIG. 1 SINGLE CABLE-LIFTER WINDLASS, TYPE 1



Right-handed



Left-handed

FIG. 2 SINGLE CABLE-LIFTER WINDLASS WITH ROPE DRUM, TYPE 2

2.9 *Single Cable-Lifter Unit—Type 3* — A windlass unit in which one cable lifter is provided with an external power source ( see Fig. 3 ).

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FIG. 3 SINGLE CABLE-LIFTER UNITS, TYPE 3

**2.10 Double Cable-Lifter Windlass—Types 4, 5 and 6** — A windlass in which the two cable-lifters, symmetrically arranged, are provided with a single integral power source (see Fig. 4, 5 and 6).

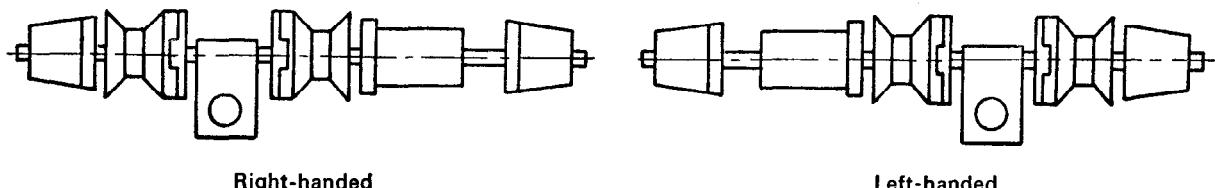


FIG. 4 DOUBLE CABLE-LIFTER WINDLASS WITH ROPE DRUM, TYPE 4

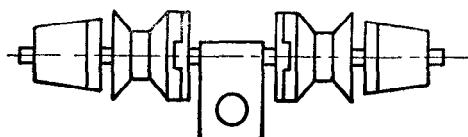


FIG. 5 SYMMETRICAL DOUBLE CABLE-LIFTER WINDLASS, TYPE 5

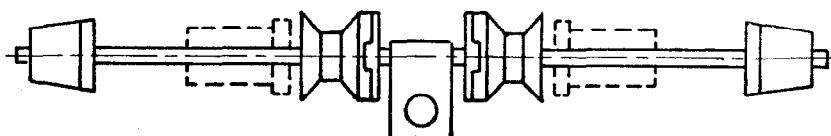


FIG. 6 SYMMETRICAL DOUBLE CABLE-LIFTER WINDLASS WITH ROPE DRUM, TYPE 6

**2.11 Anchor Capstan—Type 7** — Machinery in which the cable-lifter is mounted on a vertical shaft (see Fig. 7).

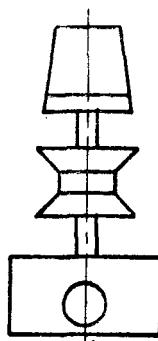


FIG. 7 ANCHOR CAPSTAN, TYPE 7

**2.12 Right-Hand or Left-Hand Windlasses** — Windlasses of Types 1, 2, 3 and 4 may be designed as right-hand or left-hand models.

**2.12.1** A windlass is termed a right-hand windlass in relation to an observer situated on the side of the motor, power supply or control gear when the drive for the cable-lifter unit is on the right-hand side of the cable-lifter.

**2.12.2** A left-hand windlass when similarly observed has the reduction gear or drive for the cable-lifter on the left-hand side of the cable-lifter.

**2.12.3** The model of a windlass provided with two cable-lifters and one cable drum (Type 4) is determined like the one of a windlass provided with one cable-lifter and a cable drum (Type 2) which constitute its main unit.

**2.13 Remote Control** — A device for controlling the dropping of an anchor from the wheel-house.

**2.14 Breaking Load of the Chain** — The minimum breaking load specified for the diameter and grade of chain concerned.

### 3. Design and Construction

**3.1 Chain Cable** — Stud and studless chain cable conforming to IS : 4692-1977 'Electrically welded studless link anchor chains and connection shackles (*first revision*)' or IS : 4484-1975 'Electrically welded stud link anchor chains and connecting shackles and swivels (*first revision*)' shall be considered for design of windlass.

#### 3.2 Cable-Lifter

**3.2.1** The cable-lifter shall have at least five snugs.

**3.2.2** The cable-lifter shall be declutchable from the drive. Power operated clutches shall be also declutchable by hand.

**3.2.3** The engagement angle of the chain cable on the cable-lifter shall be at least  $117^\circ$  for windlasses and  $150^\circ$  for anchor capstans.

**3.3 Warping Ends** — The windlass may be designed with or without warping ends. Warping ends may be fitted on an intermediate or on the cable-lifter shaft. The diameter of the warping ends shall be chosen depending on the power of the windlass.

**3.4 Rope Drum** — The mooring rope drum shall be declutchable from the drive.

The diameter of the drum shall be chosen depending on the power of the drive and be not less than:

$$d_1 = d_2 \times 16$$

where

$d_1$  is the drum diameter, and

$d_2$  is the steel wire rope diameter,  
or be agreed between the purchaser and the manufacturer.

**3.5 Strength Requirements** — The design and construction of the windlass shall comply with the following requirements for the strength of the machinery as a whole and by its elements:

- a) windlass with cable-lifter engaged shall withstand a pull according to 4.5(b) without any permanent deformation of stressed parts;
- b) windlass with brakes engaged and cable-lifter disengaged shall withstand a pull according to 4.5(c) without any permanent deformation of the stressed parts and without brake slip; and
- c) shaft of the warping end or the mooring cable drum shall withstand the breaking load of the rope, the stress being not more than 0.95 of the yield point of the material.

**Note** — Attention shall be paid to:

- a) stress concentrations in keyways and other stress raisers,
- b) dynamic effects due to sudden starting or stopping of the prime mover of chain cable or mooring rope,
- c) calculation methods and approximations used when deriving the design stresses, and
- d) requirements of the classification societies.

### 3.6 Braking System

**3.6.1 Automatic Braking System** — The windlasses shall be provided with an automatic brake system which operates when the control handle is in the 'off' position or when the power supply is

cut off. The automatic brake system shall be capable of sustaining a load corresponding with the overload given in 4.5 (d).

**3.6.2 Cable-lifter brake** — Each cable-lifter shall be fitted with a hand-brake which may be remotely controlled, capable of applying a braking torque sufficient to maintain a load equal to the holding load given in 4.5(c). The force on the handle of the hand-brake shall not exceed 150 N at the end of the handle.

### 3.7 Emergency Stop

**3.7.1** Each windlass shall be fitted with a quick acting local emergency stop mechanism which, when operated, removes power from the windlass and applies the automatic brake-system.

**3.7.2** The emergency stop mechanism shall be located in a clearly marked and accessible position close to the windlass.

**3.8 Protection** — The prime mover system of windlass shall be protected against excessive torque and shock.

**3.9 Direction of Motion of the Operating Devices** — The direction of motion of the operating devices shall be such that the chain is hauled in by clock-wise movement at the hand-wheel or crank handle or alternatively movement of a hand lever towards the operator. The direction of operation of all control handles shall be clearly and permanently marked.

## 4. Performance

**4.1** The performance requirements given in 4.5 are based on the use of one cable-lifter at a time.

**4.2** The windlass shall be capable of continuous operation for a period of 30 minutes while exerting the nominal load and also be capable of exerting, for a period of at least 2 minutes at low speed, the overload pull stated in 4.5(b) with subsequent operation of at least 5 minutes at the nominal load. The windlass drive shall be capable of creating a pull on the cable-lifter, at a motionless chain, equal to not less than the double nominal pull during 30 seconds.

**4.3** The chain cable nominal speed shall be not less than 0·15 m/s.

**4.4** The chain cable low speed shall be not more than 0·116 m/s.

**4.5** The following values shall be used for determining performance data for a windlass:

- working load in determining of which the requirements of Statutory Authorities and Classification Societies shall be taken into account,
- overload pull equal to 1·5 of the working load,
- holding load of a brake equal to 20 percent of the breaking load of the anchor chain, and
- holding load of an automatic braking system equal to 2·0 times the working load.

**4.5.1** The performance data for windlasses is given in Table 1.

TABLE 1 PERFORMANCE DATA FOR WINDLASSES

Nominal Size mm	Chain Diameter mm	Duty Pull kN	Overload Pull kN	Proof Load* kN	Braking Load of Cable kN	Working Load Diameter mm
26	26	28·7	43·3	178·6	397	250
28	28	33·3	50·2	206·3	458	250
30	30	38·3	57·6	235·9	542	250
32	32	43·5	65·5	267·3	594	250
34	34	49·1	74·0	300·5	668	250
36	36	55·1	82·9	335·5	746	250
38	38	61·4	92·4	372·7	828	320
40	40	68·0	102·4	411·3	914	320
42	42	75·0	112·9	451·5	1 000	320

\*The values are applicable to windlass.

## 5. Testing

### 5.1 Acceptance Test

**5.1.1** The following tests shall be carried out on each windlass or windlass unit. Where tests are required in excess of those listed below, they should be agreed between the purchaser and the manufacturer at the time of contract. The place of all tests shall also be agreed between the purchaser and the manufacturer at the time of contract.

**5.1.2** The windlass shall be run without load at a speed not less than nominal speed for 30 minutes, 15 minutes in each direction plus 5 minutes in each direction on each additional gear change as soon as possible after 30 minutes test.

While testing, the following shall be carried out:

- a) Check oil tightness,
- b) Measure temperature of bearings, and
- c) Note presence of abnormal noise and vibration.

**5.1.3** The windlass shall be checked to verify that the working load, nominal speed and overload pull are attainable as specified in 4.5.

While testing, the following shall be carried out:

- a) Check oil tightness,
- b) Measure temperature of bearings, and
- c) Note presence of abnormal noise and vibration.

**5.1.4** The working and satisfactory operation of the cable-lifter brake should be tested to ensure compliance with the requirements of this Indian Standard [ see 4.5(c) and (d) ].

The holding power of the cable-lifter brake may be verified by test or calculated, as agreed between purchaser and manufacturer.

The cable-lifter brake is also to be tested with the anchor dropping controlled and stopped by the brake.

**5.1.5** Where remote controls or other special features are fitted, their satisfactory operation shall be verified.

**5.2 Final Acceptance Tests** — Final acceptance tests shall be carried out during the ship's anchor trials to verify satisfactory overall performance under service conditions. Special attention should be paid to proper bedding of the cable ( and shackles if fitted ) in the cable-lifters, oil tightness, temperature of bearings, absence of abnormal noise and vibration as well as the performance of special devices.

## 6. Designation

### 6.1 The designation of windlasses shall contain:

- a) type of machinery according to 2.8, 2.9, 2.10 and 2.11 of this Indian Standard;
- b) nominal size according to 2.5;
- c) model ( *R* for right-hand, *L* for left-hand ) according to 2.12; and
- d) reference to this Indian Standard.

Note — In the case where studless cables are used the letter 'B' shall be added to the designation of windlass.

#### Example

A double cable-lifter windlass provided with a rope drum for 26 mm diameter, studless chain cable grade 1; left-hand model shall be designated as:

WINDLASS TYPE 4/26/1/B/L IS : 11474

## 7. Information to be Provided by the Purchaser

### 7.1 The information to be provided by the purchaser shall be as given in Appendix A.

## APPENDIX A

(Clause 7.1)

### INFORMATION TO BE PROVIDED BY THE PURCHASER

A-1. The purchaser shall provide the manufacturers of the windlass with the following basic information:

- a) Windlass type;
- b) Kind of drive required (electric, hydraulic, diesel or external drive) also power supply (voltage, pressure, etc) as applicable;
- c) Nominal size (diameter and grade of chain and holding load of cable-lifter brake) as applicable;
- d) Whether left or right handed or symmetrical;
- e) Whether warping ends are required and where located;
- f) Relevant classification societies;
- g) A plan of the vessel showing the disposition of the windlass;
- h) Whether remote control is to be fitted; and
- j) For anchor capstans, direction of rotation of the head when hoisting the anchor as viewed from above.

### EXPLANATORY NOTE

This standard lays down the requirements for the design, construction, safety, performance and acceptance testing of windlasses and anchor capstans for inland vessels having electric, hydraulic, steam or external drive.

The requirements covered in this standard are not applicable for special purpose crafts like dredgers, etc.

Where reference is made in the text to 'Windlass' it should be understood as 'Windlass and anchor capstans'.

This Indian Standard is based on ISO 6219-1983 'Shipbuilding—Inland vessels—Windlasses and anchor capstans', issued by the International Organization for Standardization (ISO).